A Possible Mechanoreceptor Associated with the Anterior Byssus Retractor Muscle of *Mytilus edulis* Linnaeus

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(2 Text figures)

INTRODUCTION

Mechanically sensitive receptor units have been found in the anterior byssus retractor muscle (ABRM) of *Mytilus edulis* Linnaeus, 1758 by LaCourse & Northrop (1978). They speculated that the receptors responsible for the electrophysiological sensory activity within the ABRM may be the same putative receptors described morphologically by Gilloteaux (1971, 1972), in the ABRM of *M. edulis* as "neuromuscular associations." These associations, stained by an osmium-zinc iodine technique, were interpreted by Gilloteaux (1971, 1972) as interoreceptors. Analogous associations have been observed by LaCourse *et al.* (1979) in the ABRM of *M. edulis* using the method of cobalt chloride axonal iontophoresis, an intracellular staining technique. Using this technique they also established a direct morphological route between the associations and the pedal ganglion via the visceral nerves and the cerebropedal nerve.

In the present study we were able to observe with good morphological detail these associations.

METHODS AND MATERIALS

Specimens of adult mussels were collected at Ocean Beach, New London, Connecticut, and held in tanks of cooled, aerated sea water in the laboratory until use.

The right or left ABRM was dissected from the animal and the clinging connective tissue. It was then placed into a bath of cold filtered sea water. The muscle was then transferred into a 1% solution of pure methylene blue chloride and shredded by hand into smaller slender pieces with fine glass probes. Following the method of Zawarzin (1912) the tissue was put in the stain in such a way that parts of the shredded muscle tissue were exposed to the air. Within 5-30 minutes the associations were observable.

RESULTS AND DISCUSSION

The association is composed of one efferent nerve branch supplying the nerve ending. The nerve fiber, 0.5-1.1 μm in diameter, forms a large spiral, twisted around the smooth muscle fiber. The muscle fiber of the association is modified; it is thinner, 3.6-4.05 μm in diameter, than the contractile well-shaped normal fiber, 4.0-4.5 μm in diameter. Just before the nerve terminates in the muscle fiber, it swells forming a bipolar unit which has a length of 3.5-4.1 μm and a width of 0.75-1.8 μm. Not well shown in this photo-micrograph (Figure 1), but illustrated in Figure 2, are very thin processes extending from the bipolar unit.

It is our speculation that the bipolar unit is the sensory cell's soma and the thin processes from the soma are its dendritic tree. Similar bipolar cells have been observed embedded in connective tissue around the shafts of thick

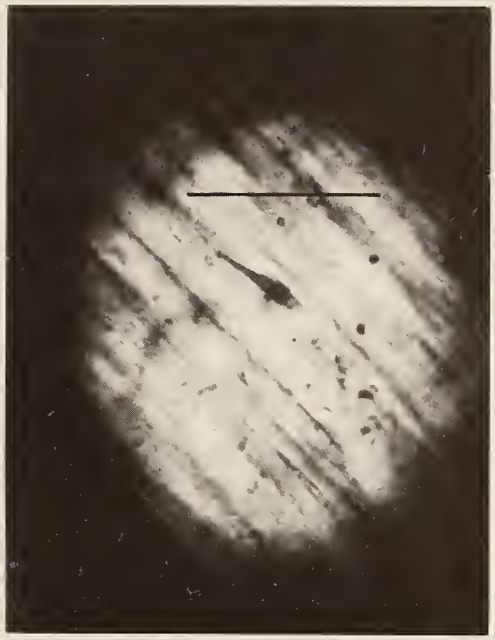

Figure 1

A neuromuscular association in the ABRM of *Mytilus* photomicrograph of the mechanoreceptor, 8 μm rule

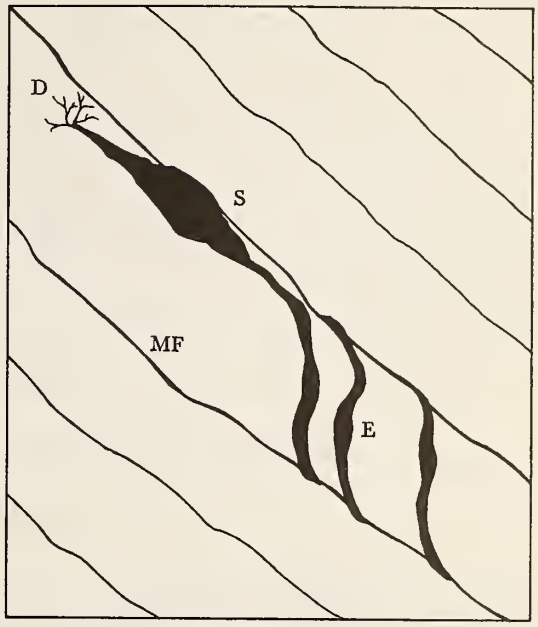

Figure 2

Illustration of the mechanoreceptor
D – dendritic tree S – soma E – efferent axon
MF – modified muscle fiber

apodemes of the tailspine muscle of *Limulus polyphemus* by Eagles & Hartman (1975), who speculated that these bipolar cells are tension receptors.

Our observations and previously-reported findings suggest that these neuromuscular associations are the mechanoreceptors described electrophysiologically by LaCourse & Northrop (1978). The probable mechanoreceptor is composed of a modified muscle fiber and a sensory nerve.

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